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EFFECTS OF A 26-WEEKS SHALLOW WATER HEAD-OUT AQUATIC EXERCISE PROGRAM IN THE ANTHROPOMETRICS, BODY COMPOSITION AND PHYSIOLOGICAL RESPONSE OF HEALTHY MIDDLE-AGE WOMEN

1. Introduction

Research about head-out aquatic exercise can focus in acute or chronic responses. Chronic adaptations represent the accumulation of acute responses during each aquatic session. To promote these cumulative effects of acute responses over time, the use of appropriate means and methods of work during the sessions (i.e., mode or type of exercise, frequency of participation, duration of each exercise bout, and intensity of the exercise bout) are warranted (Barbosa et al., 2009). Aerobic capacity, body composition, flexibility, muscular strength and endurance are monitored on a regular basis to assess chronic adaptations (Wilmore & Costill, 1994).

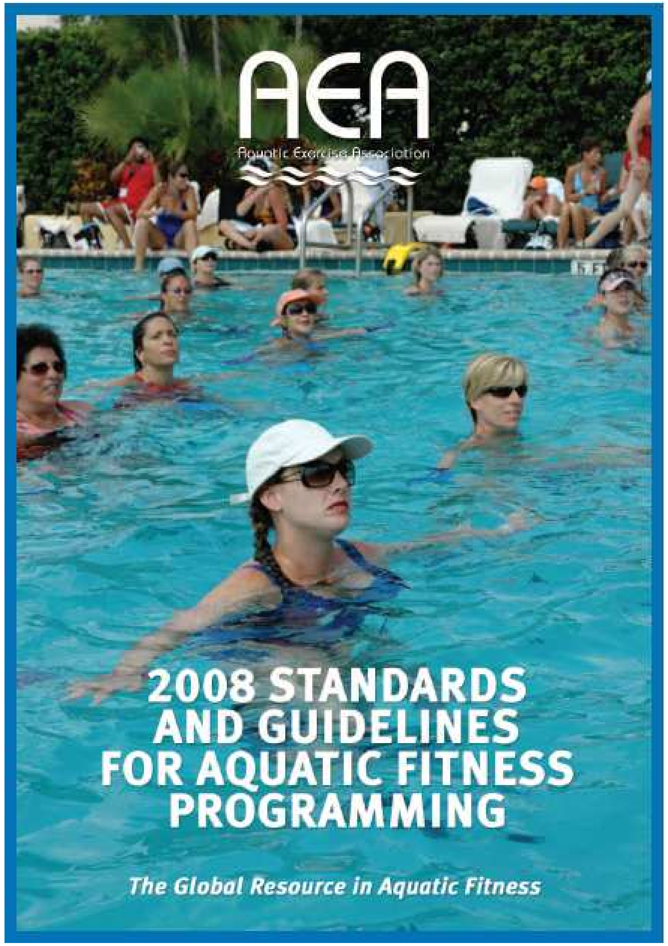
One trend of research regarding this topic is the effect of a head-out aquatic exercise program in elderly, subject with an injury or pathology and even physically challenged. However, a small quantity of research is done with middle-aged healthy women, although they are a large part of the persons participating in head-out aquatic exercise sessions.

The aim of this study was to assess the chronic adaptations (anthropometrics, body composition, physiologic) of the middle-aged women participating in a head-out aquatic exercise program during 26 weeks. It was hypothesized a significant improvement in the anthropometrics, body composition and physiological response throughout the exercise program.

2. Methods

Subjects. Twenty-three middle-age women (47.6 ± 10.1 years-old; 160.4 ± 1.7 cm of body height) participated in the head-out aquatic exercise program. None of the subjects were involved in any other fitness program during the research. Subjects were asked to maintain their daily routines. Subjects reported no previous history of orthopedic or muscle-skeletal injuries in the previous six months.

Head-out aquatic exercise program. The head-out aquatic exercise program had 26 weeks and followed the main Aquatic Exercise Association guidelines (Aquatic Exercise Association, 2008). Program included two sessions per week, with 40 minutes of duration each.



All sessions were conducted in a shallow water swimming pool, immersed to the xiphoid process. Music cadence ranged between approximately 125-150 bpm and exercises were cued to be most of the times performed at water tempo. In some sessions, rubber bands, buoyancy and drag equipment were used.

Sessions were structured taking into account the technical literature (Kinder and See, 1992) starting with a warm-up (5 minutes), followed by cardio-respiratory conditioning (20 minutes), muscle strength conditioning (10 minutes) and, stretches and/or cool down (5 minutes). Subjects participated in 80.1 ± 10.1 % of the sessions.

Data Collection. Data was collected before starting the program (pre-test), at the 13th week (post-test 1) and at the 26th week (post-test 2).

Anthropometrical data included the measurement of the body mass (BM) in the upright position with a digital scale (SECA, 884, Germany). Body mass index (BMI) was computed as BMI=body mass/height^2. The chest, waist, hip, lower leg and brachial perimeters were measured with a flexible anthropometrical tape (RossCraft, Canada).

For body composition assessment, a skinfold caliper (Harpenden, RossCraft, Canada) was used to measure the triceps, subscapular, abdominal, germinal skinfolds and the sum of the triceps plus the subscapular skinfolds with the subjects in the specific anatomical position.

Physiological measures included the resting heart rate (HRr), systolic (SBP) and diastolic blood pressure (DBP) (M4-I, Omron, Netherlands) with the subjects in a seated position. Mean blood pressure was calculated as MBP=DBP+[0.333x(SBP-DBP)] (Wilmore & Costill. 1994).

Statistical Procedures. The normality of the distributions was assessed with the Shapiro-Wilk test.

For descriptive analysis, box plots, including quartiles, were performed. Non-parametric

Friedman test was used to compare each variable throughout the exercise program. Whenever a significant difference was verified, Pairwise Wilcoxon Rank Sum Tests were used to identify between each moment those differences happened.

The level of statistical significance was set at $P \leq 0.05$.

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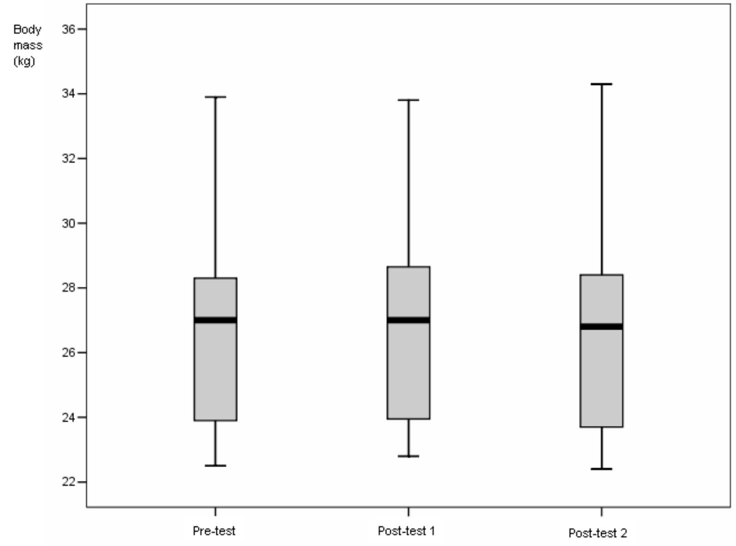
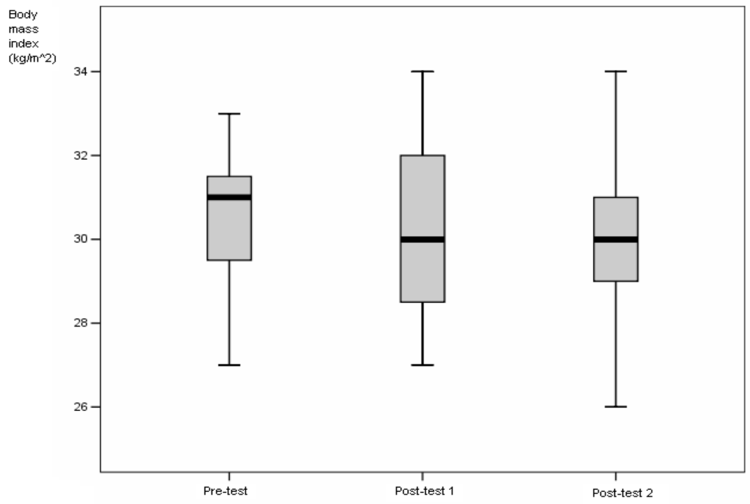
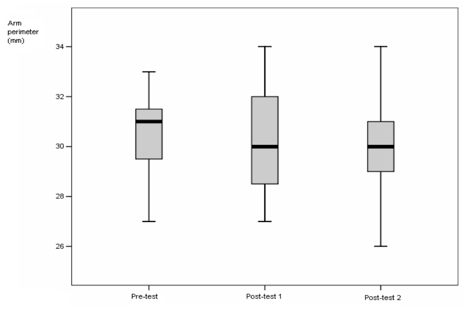
3. Results

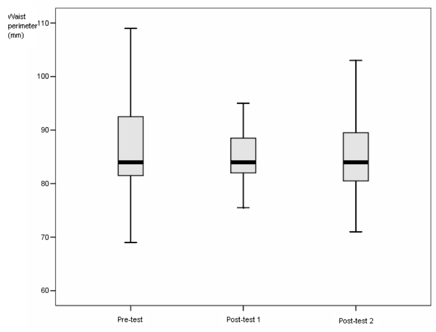
Significant differences were verified throughout the three evaluation moments in: (i) the brachial perimeter ($\chi^2(2) = 7.811$; $p = 0.02$) with significant decrease from pre-test to post-test 1 ($p = 0.03$) and post-test 2 ($p = 0.01$); (ii) waist perimeter ($\chi^2(2) = 7.634$; $p = 0.02$) with significant decreases from pre-test to post-test 1 ($p = 0.05$); (iii) hip perimeter ($\chi^2(2) = 15.367$; $p < 0.001$) with significant decrease between all evaluation moments; (iv) lower leg perimeter ($\chi^2(2) = 24.641$; $p < 0.001$) with significant decrease between all evaluation moments; (v) triceps skinfold ($\chi^2(2) = 9.566$; $p < 0.01$) with significant decrease between pre-test and post-test 1 ($p < 0.001$) and post-test 2 ($p < 0.01$); (vi) subscapular skinfold ($\chi^2(2) = 10.541$; $p < 0.01$) with significant decrease between pre-test and post-test 1 ($p < 0.01$) and post-test 2 ($p < 0.01$);

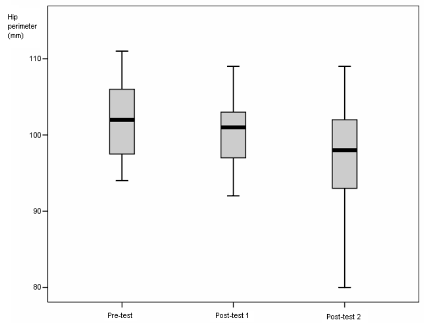


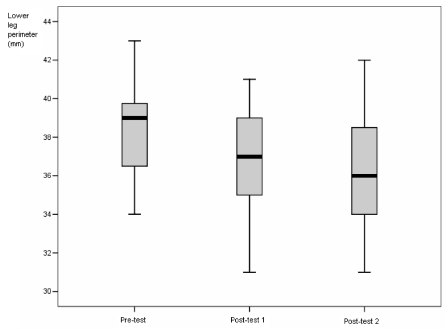


(vii) abdominal skinfold ($\chi^2(2) = 13.390$; $p < 0.01$) with significant decrease between pre-test and post-test 1 ($p < 0.01$) and post-test 2 ($p < 0.01$); (viii) lower leg skinfold ($\chi^2(2) = 6.100$; $p = 0.05$) with significant decrease between pre-test and post-test 1 ($p = 0.01$) and post-test 2 ($p = 0.04$); (ix) the sum of triceps with subscapular skinfold ($\chi^2(2) = 18.396$; $p < 0.001$) with significant decrease between pre-test and post-test 1 ($p < 0.001$) and post-test 2 ($p < 0.001$); (x) the SBP ($\chi^2(2) = 8.000$; $p = 0.02$) with significant decrease between pre-test and post-test 1 ($p = 0.01$) and post-test 2 ($p < 0.01$) and; (xi) MBP ($\chi^2(2) = 12.568$; $p < 0.01$) with significant decrease between pre-test and post-test 2 ($p = 0.04$) and between post-test 1 and post-test 2 ($p = 0.01$). Remaining variables did not presented significant improvements.









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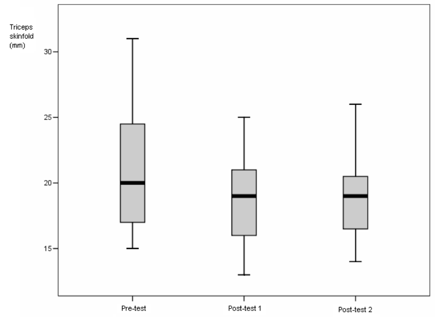

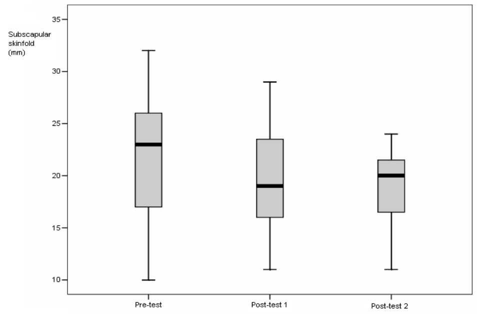

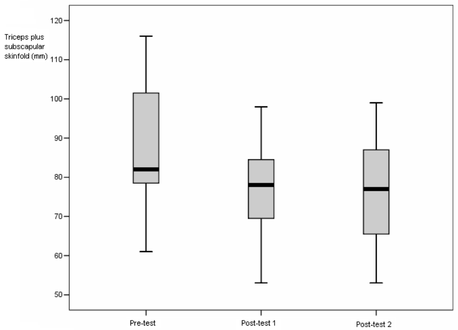

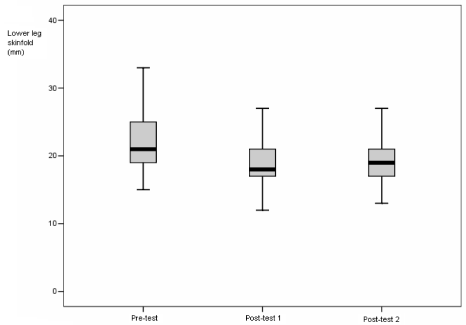

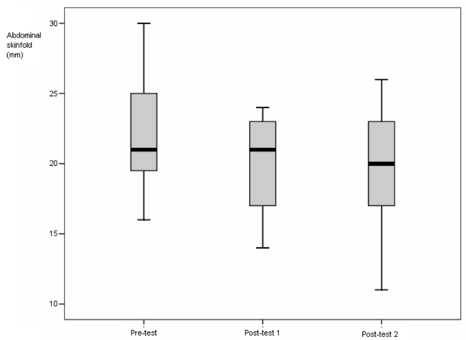

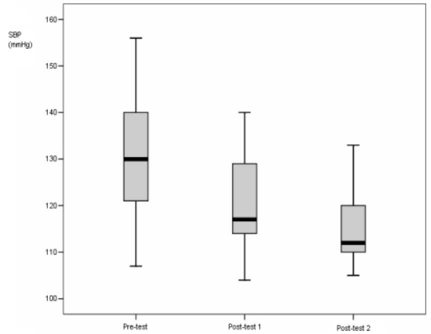

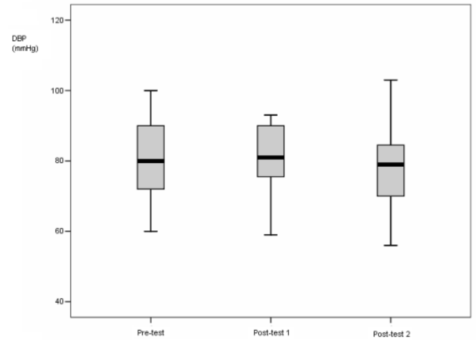

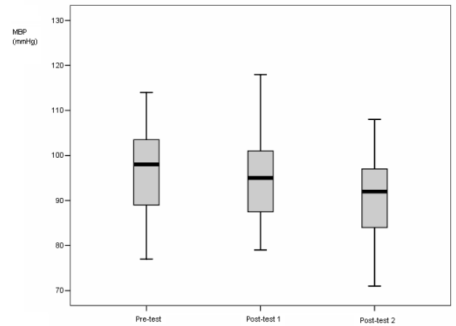

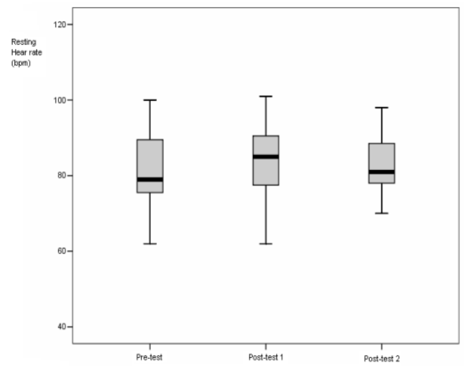

4. Conclusions

As a conclusion, a head-out aquatic exercise program with 26 weeks promotes significant improvements in anthropometrics, body composition and physiological response of healthy middle-age women. Such improvements happened mainly in the first 13 weeks of the program.

As a practical implication, instructors should design and conduct head-out aquatic exercise programs according to Aquatic Exercise Association guidelines for at least 13 to 26 weeks to promote significant body composition and physiological changes in middle-age women.

5. References

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